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BACHMAN & LAPOINTE, P.C.
900 CHAPEL STREET
SUITE 1201
NEW HAVEN, CT 06510

EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
3663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/773,733	YOON ET AL.	
	Examiner	Art Unit	
	JOHANNES P. MONDT	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Amendment filed 8/11/08 forms the basis for this Office Action. In said Amendment applicants cancelled claim 9, substantially amended claims 10-16 through substantial amendment of independent claim 15 and of dependent claims 10 and 11, and added new claims 17-20. Comments on "Remarks/Arguments" included in the Response filed with said Amendment are provided below under "Response to Arguments".

Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. ***Claim 20*** recites the limitation "the vertical support parties" in line 2. There is insufficient antecedent basis for this limitation in the claim.

3. ***Claim 20*** is further rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention because the "edges" in the limitation "at top and bottom edges" are not defined with regard to a definite structure of which they are "edges".

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. ***Claims 15-16 and 20*** are rejected under 35 U.S.C. 103(a) as being unpatentable (A) over Oh et al (6,393,087 B1) (previously cited) in view of Mayet et al (6,542,567 B1) (previously cited) and Foulds et al (US 3,966,550) (previously cited). N.B.: the rejection of claim 20 is provided to the best of examiner's understanding, noting the indefiniteness under35 U./S.C. 112, second paragraph, as explained overhead in sections 2 and 3.

Oh et al teach (title, abstract, Figures 1-3 and cols. 1, 2, 5, 6, 7, 8 and 9) a spacer grid 2 (col. 5, l. 55-63) for placing and supporting a plurality of longitudinal fuel rods 106 (col. 1, l. 19) in a nuclear reactor fuel assembly (first sentence of the abstract), comprising

a plurality of inner strips 113 (col. 1, l. 26-28) intersecting each other to form a plurality of guide tube cells 108 (col. 1, l. 30-31) to receive guide tubes 103 (col. 1, l. 18-19) therein (see Figure 1) and

a plurality of fuel rod cells 8 or 108 (col. 1, l. 29-30 and col., col. 6, l. 22) to receive the fuel rods 6 or 106 (col. 1, l. 35-36 and col. 6, l. 44-46) therein, with a plurality of mixing blades 32 (col. 7, l. 1-14) projecting upward from the inner strips at intersections of the inner strips (Figures 5-6, 8 and 9); and

a plurality of perimeter strips (outer strips 113; loc.cit.) each of which comprises a plurality of unit strips including intermediate unit strips and corner unit strips (necessarily so, as all intermediate strips are included in their interior), the perimeter strips (as the outer strips necessarily) encircling the intersecting inner strips and the corner unit strips

forming outermost corner cells of the spacer grid (because they are cells at the corners),

with a grid spring 12/13/14 (col. 6, l. 7-10) provided on each of the unit strips, the grid spring comprising (see Figures 5 and 6):

a vertical opening 13 or 14 (col. 6, l. 7-10) formed at a central area of each of the unit strips;

a vertical support part (un-numbered trapezoid shaped end portions abutting said vertical opening on both bottom and top sides thereof) extending vertically in the vertical opening between top and bottom edges of the vertical opening (any structure abutting an opening can be said to extend in said opening); and

a fuel rod support part 12 (col. 6, l. 7-10) provided at a central portion of the vertical support part (namely: in between said vertical support part top and bottom portions), the fuel support part being bent (col. 6, l. 42-44) and thereby having the capability of providing a equiangular support surface equiangular to a fuel rod supported by the grid spring ("equiangular" meaning all angles being equal implying contact over a non-zero-measure surface) (see the disclosure in Oh et al of a *strip-shaped* line contact through a pressing process of the elastic spring material (col. 6, l. 40) and of contact over a surface *area*: col. 6, l. 63-64).

Oh et al do not necessarily teach the further limitations as defined by the limitations on inner grid springs on the inner strips, inner support part and inner fuel rod support part as recited in the final nine (9) lines of claim 15 and by claim 16.

However, it would have been obvious to include said further limitations in view of

(a) Mayet et al, who teach to use Zircaloy for the material embodiment of the straps including springs in those regions with the higher neutron flux (col. 1, l. 23-27) (examiner takes official notice that Zircaloy excels through low neutron cross section, whence the preference for Zircaloy under high neutron flux; see also DeMario (loc.cit.), col. 7, l. 10-16), while on the other hand it is known that the mechanical strength of Zircaloy diminishes rapidly due to neutron irradiation (see Mayet et al, loc.cit.) thus making it less preferable in the edge region where neutron flux is lower than in the center of the spacer grid; it would hence have been obvious to use a viable alternative for Zircaloy in the edge region, such as steel in view of

(b) Foulds (col. 9, l. 61- col. 10, l. 8) for which the recommended spring constant exceeds that for Zircaloy.

Motivation to include the teaching by Mayet et al and Foulds et al in the invention by Oh et al derives from the advantage to reduce neutron loss by using Zircaloy while preventing mechanical deterioration of the springs where an alternative such as steel is acceptable because of reduced neutron flux.

On claim 20: While noting the indefiniteness of claim 20 under 35 U.S.C. 112, second paragraph, as noted above, a rejection to the best of examiner's understanding based on a replacement of "parties" with "part is" in line 2, and which interprets top and bottom edges to be either edges of the vertical support part or the fuel rod support part, is grounded on the observation that in Oh et al the fuel rod support part 12 is connected

to the vertical support part at top and bottom edges of said vertical support part and of said fuel rod support part.

3. ***Claims 10 and 15-16*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Delafosse et al (US 4,224,107) in view of Chun et al, Mayet et al (6,542,567 B1) and Foulds (3,966,550).

Delafosse et al teach a spacer grid 1 (col. 2, l. 49-51) capable of being used for placing and supporting a plurality of longitudinal fuel rods (fuel pins not shown; see col. 2, l. 48-64) in a nuclear reactor fuel assembly (title, col. 1, l. 5 – col. 2, l. 64), comprising a plurality of inner strips 2 and 3 intersecting each other and forming a plurality of cells A (Figure 8 and col. 2, l. 48-64) *capable* to receive guide tubes and fuel rods therein, with a plurality of mixing blades (Figures 8-9; see elevated, protruding portions of 2 and 3) projecting upward from the inner strips 2 and 3 at intersections of the inner strips; and a plurality of perimeter strips 2a and 3a ((Figure 8 and col. 2, l. 48-64) each comprising a plurality of unit strips including intermediate unit strips and corner unit strips (intermediate unit strip is shown separated from corner unit strip by 20 in Figure 8), the perimeter strips encircling the intersecting inner strips 2a and 3a encircling the intersecting inner strips 2 and 3 and the corner unit strips forming outermost corner cells of spacer grid 1 with a grid spring 5 (col. 3, l. 22-55 and Figures 4-6 and 8-9), the grid spring comprising:

a vertical opening (opening in 2a or 3a; Figures 8-9) formed at a central area of each of the unit strips;

a vertical support part 14 extending vertically in the vertical opening between central portions of top and bottom edges of the vertical opening (col. 4, l. 1-28 and Figure 5); and a fuel rod support part 6 (col. 2, l. 64 – col. 3, l. 11) provided at a central portion of the vertical support part (Figure 5).

Delafosse et al do not necessarily teach the limitation "the fuel rod support part being bent to have an equiangular support surface which is equiangular to a fuel rod supported by the grid spring".

However, it would have been obvious to include said limitation in view of Chun et al, who, in a patent on a spacer grid for a fuel assembly (title, abstract), hence analogous art, teach the spring (30) to have a curved contact portion (31) so as to be in equiangular contact with a circumferential surface of the fuel element (11) for the specific purpose of enhancing vibration suppressing and abrasion resistance forces (see abstract, Figures 3, 8 and col. 5, l. 1 – col. 6, l. 3). *Motivation* to include the teaching by Chun et al in the invention by Delafosse et al derives from the teaching by Chun et al of enhanced vibration suppressing and abrasion resistance forces (abstract, final sentence).

Delafosse et al nor Chun et al necessarily teach the further limitations as defined by the limitations on inner grid springs on the inner strips, inner support part and inner fuel rod support part as recited in the final nine (9) lines of claim 15 and by claim 16.

However, it would have been obvious to include said further limitations in view of

(a) Mayet et al, who teach to use Zircaloy for the material embodiment of the straps including springs in those regions with the higher neutron flux (col. 1, l. 23-27)

(examiner takes official notice that Zircaloy excels through low neutron cross section, whence the preference for Zircaloy under high neutron flux; see also DeMario (loc.cit.), col. 7, l. 10-16), while on the other hand it is known that the mechanical strength of Zircaloy diminishes rapidly due to neutron irradiation (see Mayet et al, loc.cit.) thus making it less preferable in the edge region where neutron flux is lower than in the center of the spacer grid; it would hence have been obvious to use a viable alternative for Zircaloy in the edge region, such as steel in view of

(b) Foulds (col. 9, l. 61- col. 10, l. 8) for which the recommended spring constant exceeds that for Zircaloy.

Motivation to include the teaching by Mayet et al and Foulds et al in the invention by Delafosse et al derives from the advantage to reduce neutron loss by using Zircaloy while preventing mechanical deterioration of the springs where an alternative such as steel is acceptable because of reduced neutron flux.

On claim 10: in the combined invention by Delafosse et al and Chun et al defined above, the vertical support part 14 is bent at two steps along substantially horizontal bending lines (due to the corrugated nature of the corrugated strips 5 in Delafosse et al; see Figures 3-6 and abstract; col. 2, l. 64 – col. 3, l. 11), and the fuel rod support part 6 is bent in such a way as to be equiangular with the fuel rods 11 (see Chun et al, Figures 3 and 8, and col. 5, l. 1 – col. 6, l. 3). The claimed "uniform contact pressure distribution when the fuel rod support part is in contact with each of the fuel rods" is an inherent consequence of the equiangular contact between 6 and 11 because contact conditions

are invariant along the line of contact, the outer surface of 6 following the periphery of fuel rods 11.

4. ***Claims 11-12*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al, Mayet et al and Foulds (as applied to claim 15 above) and further in view of De Mario et al (5,303,276) (previously made of record).

On claim 11: As detailed above, claim 15 is unpatentable over Oh et al in view of Mayet et al and Foulds et al.. Further according to Oh et al, each of the intermediate unit strips has a coolant flow guide vane 30 (i.e., longer one of two structures 30 shown in the upper portion of Figure 9) and a guide tap (shorter one of two structures 30 shown in an upper portion of Figure 9) on an upper edge thereof (col. 7, l. 1-14 and Figure 9) such that a plurality of coolant flow guide vanes and a plurality of guide taps are alternately arranged (col. 7, l. 33-39) along an upper edge of each of the intermediate unit strips (loc.cit. and Figure 14 and col. 7, l. 15-24)., Oh et al do not necessarily teach the further limitation that "each of the corner unit strips having either a coolant flow guide vane or guide tap on an upper edge thereof to complete an alternate arrangement of the coolant flow guide vanes and guide taps".

However, it would have been obvious to include said further limitation in view of De Mario et al, who teach upper and lower edges of the perimeter strips, and hence also of corner unit strips to have guide/protective/flow taps or vanes of different geometric dimensions bent inwardly in an alternating arrangement (Figure 3 in De Mario et al; see vanes over 320 and col. 8, l. 16-28), incorporation of the teaching in this regard by Mario et al thus completing an alternate arrangement of coolant flow guide vanes and

guide taps in cooperation with the intermediate unit strips. *Motivation* to include the teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

On claim 12: Furthermore, although Oh et al do not necessarily teach the further limitation as defined by claim12 it would have been obvious to include said further limitation in view of De Mario et al, who teach each of the intermediate cells walls to have downwardly projecting guide taps (downward protrusions thereof as shown in Figure 3) at both corners (i.e., at both the left and right corner adjacent lattice members 310 of each intermediate unit strips and each of the plurality of corner unit strips has a guide tap projecting downward on a lower edge of each of the corner unit strips (see element 330 in Figure 3 of De Mario and col. 8, l. 28-34). *Motivation* to include the teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

1. ***Claim 13*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al, Mayet et al, Foulds et al and De Mario et al as applied to claim 11 above, and further in view of Delafosse et al (4,224,107) (previously made of record).

As detailed above, claim 11 is unpatentable over Oh et al in view of Mayet et al, Foulds et al De Mario et al. Furthermore, each of the coolant (flow guide) vanes in Oh et

al is bent toward a center of the spacer grid because each of said coolant vanes is shown, and in order to cause a swirl of the coolant fluid: must be, bent in two orthogonal directions so as to cause a swirl, i.e., a rotation of the fluid (see Figures 8 and 9 and col. 7, l. 1-68). Said two directions span a plane. The vector connecting each coolant flow guide vane with *a* center of said spacer grid toward a center of the spacer grid (as opposed to *the* center of said spacer grid (the latter may not even exist, in the case when the number of cells in either a row or a column is even), as any center of any element qualifies to be a center of said spacer grid). Furthermore, it is noted that Oh et al teach elements 30 to be "bent towards the center of the main flow path" (col. 7, l. 1-14), which center, when said flow path is taken as a whole, is substantially identical to the center in a horizontal cross section of the spacer grid. Oh et al also show a width of each of said guide vanes reducing from a position at which each of said guide vanes is initially bent (see Figure 6), showing a tapered shape (loc.cit.).

Oh et al do not necessarily teach the further limitation that a peak of each of the guide vanes to be rounded. However, they do indicate that its specific shape is a matter of design choice because said shape can be chosen "in accordance with a desired swirl flow" (col. 7, l. 44-49). Furthermore, it would have been obvious to include said further limitation in view of Delafosse et al, who teach the rounding of protrusions 9 over unit strips 2 and 3 (hence structurally analogous to protrusions 30 of Oh et al), where the rounding is to as to avoid jamming (col. 3, l. 12-20). *Motivation* to include the teaching by Delafosse et al immediately derives from the advantage of the avoidance of jamming.

2. ***Claim 14*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al, Mayet et al, Foulds et al and DeMario et alas applied to claim 11 above, and further in view of Nguyen et al (6,526,116 B1) (previously made of record).

As detailed above, claim 11 is unpatentable over Oh et al, in view of Mayet et al, Foulds et al and DeMario et al. Although Oh et al nor DeMario et al necessarily teach the further limitation defined by claim 14, it would have been obvious to include said further limitation in view of Nguyen et al, who, in a patent on nuclear fuel assemblies with spacer grid ("support grid", see abstract, first sentence) and mixing vanes (loc.cit.), hence analogous art, teach each guide tap 32 to be bent in two lateral directions orthogonal to each other, hence also in the direction towards the center of the spacer grid (col. 5, l. 10-43, and Figures 1 and 2). *Motivation* to include the teaching by Nguyen et al in the invention by Oh et al and DeMario et al derives from the resultant balance of hydraulic forces across the center of the grid (see abstract).

5. ***Claims 17-19*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al, Mayet et al and Foulds et al as applied to claim 15 above, and further in view of Anthony (US 4,89,241). As detailed above, claim 15 is unpatentable over Oh et al in view of Mayet et al and Foulds et al. Oh et al do not necessarily teach the further limitations defined by claims 17-19. However, it would have been obvious to include said limitations in view of Anthony, who, in a patent on a grid for a nuclear fuel assembly with inner grid springs meeting 'inner support part' (34) (col. 4, l. 60+) and peripheral grid springs meeting 'vertical support part' (38, 50, 70, 72, 74) (col. 4, l. 60+ and col. 6, l. 58+), - hence art analogous art, teaches as a means to prevent bowing two different

peripheral, primary (70) and secondary (72) (Figures 5-7 and abstract, and col. 6, l. 58+) grid springs with a different geometry (claim 17) and shape (claim 18) (see 38, 70 and 72 in Figures 3-5 (as well as spring constant) (col. 6, l. 58+ and col. 7, l. 11-16). Furthermore, because all inner grid springs are cantilevered, while some peripheral grid springs (50,70,72) are not cantilevered, claim 19 is met (as evidentiary reference establishing fact that the cantilevered variety has a much lower spring constant see, e.g., Barkhurst (US 5,434,898), especially col. 8, l. 61 – col. 9, l. 5). *Motivation* to include the teaching by Anthony in the combined invention by Oh et al, Mayet et al and Foulds et al directly derives from the undesirability of bowing in any nuclear fuel assembly, including the nuclear fuel assembly by Oh et al. Inclusion of said teaching meets the claim limitations defined by claims 17 and 18 because inner grid springs 34 cannot have the same shape and geometry as two differently shaped peripheral grid springs at the same time. Furthermore, with regard to claim 19 it is noted that the very purpose of Anthony's additional peripheral grid springs is to provide counter-forces to the tendency of bowing through providing additional stiffness (abstract, "Summary of the Invention"), from which it follows that it would have been obvious to one of ordinary skill in the art to select the peripheral grid springs with greater stiffness than the inner grid springs.

Response to Arguments

6. Applicant's arguments filed 8/11/08 have been fully considered but they are not persuasive. In particular, referring to the Interview Summary mailed 6/20/08, an

amendment replacing the limitation "different in structure" (final line of claim 15) with a recitation of a different in geometric structure would have overcome the rejection under 103(a). No such amendment is in evidence. The amendment omitting "in a rest position" merely results in a duplication of claims 15 and 16 as they appeared in the amendment filed 3/6/07, which stand rejected over Oh et al in view of Mayet et al and Foulds; or, in the alternative, over Delafosse et al in view of Chun, Mayet et al and Foulds (see section 6 of the Office Action mailed 5/15/08, pages 11-12), which rejections are herewith provided again. Claims 17-20 are truly new and have been examined at the earliest possible time.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHANNES P. MONDT whose telephone number is (571)272-1919. The examiner can normally be reached on 7:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Johannes P Mondt/
Primary Examiner, Art Unit 3663